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Simulative Study Based on Mobility Models using Routing Protocol

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***Abstract*—**Mobility Model in Ad Hoc network plays a significant role in determining the protocol performance with the help of mobility models in Wireless Ad Hoc Network. Thus, it is essential to study and analyze various mobility models and their effect on Wireless Ad Hoc Network. In this manuscript, we have used mobility models to analyze the effect of diverse mobility patterns such as Random Waypoint Mobility and Reference Point Group Mobility Model in a realistic environment to get a realistic simulation. The mobility model is evaluated and compared to existing mobility models in ns-2.35 simulations with the help of DSR routing protocol. Therefore, using mobility as a model is an important aspect of enhancing the self-confidence in the simulation result of the networks.

***Keywords*—**Wireless Ad Hoc Network,Routing Protocol,Mobility Models,NS2.35,BoonMotion-2.0.

1. INTRODUCTION

In Wireless ad-hoc networks, node mobility is a significant problem due to ad-hoc characteristics such as dynamic network topology, shared medium, limited bandwidth, multi-hop nature and security etc. Thus, there is requirement of effective mobility management scheme i.e. “seamless mobility in ad-hoc networks. Seamless mobility provides easy access and effective communication among nodes present in the network.

In this paper, an attempt has been made for the performance of protocol for different mobility models. We have analyzed the performance of protocol and to evaluate its performance for Mobility Models. Over the most recent quite a while the Ad hoc wireless network directing conventions and versatility show mixes have been contemplated generally. These investigations have utilized distinctive Ad hoc wireless network parameters for execution assessment because of which the consistency for correlation among the exploration works has been missing. This work gives an extensive report utilizing extensive variety of Ad hoc wireless network parameters, and make determinations for the execution of steering conventions under various versatility models.

This paper is an attempt to advance systematic measurements of execution evaluation under various Ad hoc wireless network parameter arrangements. The paper is written as follows: Section I provides a succinct presentation of the wireless ad hocnetwork. Section II provides a concise presentation of, DSR routing protocol, sensitive and constructive steering conventions. Section III presents a portion of the models for versatility, viz.Random Waypoint Mobility and Mobility of the Reference Point Group (RPGM).Section IV includes a written survey in which the execution evaluationwas tested for blendsof management norms and flexibility models. Section V traces the parameters of the Ad hoc wireless network considered for the investigation and describes the measurements of the information examination used. Section VI shows the result of the propagation and includes a summary of the effects. In conclusion, Section VII describes the conclusion of the analytical work”.

2. ROUTING PROTOCOLS USED

Dynamic Source Routing (DSR): Here, the source hub asks for a course to the goal hub on request, much the same as the AODV convention. The source directing technique is utilized as a part of DSR, which decides the total succession of hubs by means of which the information bundles will be sent. The course revelation asked for is started by the source hub by communicating a course ask for parcel. Upon the fruitful finishing of course ask for, the initiator hub gets a reaction bundle which contains the arrangement of hubs by which the goal could be come to. The succession of hubs is gathered amid the spread of the inquiry in the system in the record field of the course ask for bundle. There are many directing conventions which depict the way to transmit the information from source to goal. Here, we present one convention each from the proactive, receptive and cross breed classification.

3. MOBILITY MODELS USED

In this part the mobility models used in the studies are presented.In Wireless Ad Hoc Networks the hubs continue moving with time. i.e., the hubs are versatile. The position of a hub changes with time as it moves with certain speed and increasing speed. There are a few portability models which emulate the development of the hubs in Wireless Ad Hoc Networks. Mobility models in wireless ad-hoc networks describe mathematical representation of movement pattern of nodes and how their location, velocity, speed, direction and acceleration change over time. In these networks, mobile nodes communicate directly with each other. Communication between two nodes doesnot produce effective results if both nodes are not in same transmission range. This problem can be resolved by using intermediate nodes with routing. Thus, routing is very important in mobile ad-hoc networks where mobility models must be evaluated with respect to end to end delayand efficient data transmission. Mobility models

are intended to focus on individual mobility patterns due to point to pointcommunication in cellular networks [1-5] whereas ad-hoc networks are designed forgroup communication.Suchmodels are suggested to maintain movement, and efficient transmission among nodes in real life applications. In addition to this, these models are mainly focused on the individual motion behavior between mobility eras with minimum simulation time in which a mobile node moves with constant speed and direction. These models represent the features of the mobile nodes in an ad-hoc network like speed, direction, distance and node movement. Mobility models may be categorized based on the following criteria which is based on dimension, scale of mobility, randomness, geographical constraints, destination oriented and by changing parameters.
The impact of versatility display in mix with the directing conventions is analyzed in this investigation. The versatility models utilized are talked about next.

3.1 Random Waypoint mobility model
This model is simple and is widely used to evaluate the performance of Ad-Hoc Network. The random waypoint mobility model contains pause time between changes in direction and/or speed. Once a mobile node (MN) starts to move, it stays at one place for a particular pause time. After the particular pause time is forgotten, the MN randomly choose the next destination in the simulation area and chooses a speed regularly distributed among the minimum speed and maximum speed and travels with a speed v whose value is uniformly chosen in the interval (0,Vmax). Vmax is some parameter that may be set to replicate the degree of mobility. Then, the MN continues its tripin the direction of the newly chosen destination at the selected speed. As soon as the MN arrives at the destination, it stays again for the indicated pause time before repeating the procedure.Two drawbacks of this mobility model are sharp turn and sudden stop. Sharp turn occurs whenever there is a direction change in the range [6]. Sudden stop occurs whenever there is a change of speed that is not relative to the previous speed. These problems can be eliminated by allowing the past speed and direction to affect the upcoming speed and direction.

3.2. Reference Point Group Mobility Model(RPGM):
This Mobility Model is proposed in this model is described as another way to simulate group behavior in[16-18], where each node belongs to a group where every node follows a logical center i.e group leader, that determines the group's motion activities. The nodes in a group are usually randomly distributed around the reference point. The different nodes use their own mobility model and are then added to the reference point which drives them in the route of the group. At each moment, every node has a speed and direction that is derived by randomly different from that of the group leader [8-10]. This general description of group mobility can be used tocreate a variety of models for different kinds of mobility applications. Group mobility as such can be used in military battlefield communications [15-18]. One example of such mobility is that a number of soldiers may move jointly in a group. Another example is during disaster relief where various rescue crews i.e.firemen, policemen form dissimilar groups and work considerately.

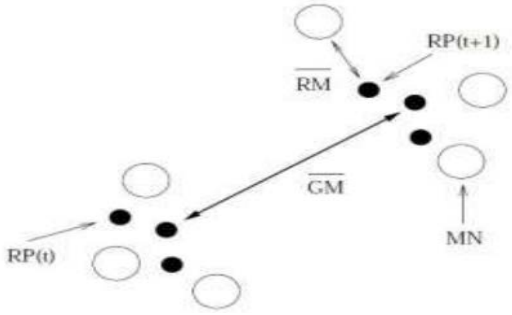

Figure 1. Movements of three MNs using RPGM Model [2]

The mobility of the nodes within the group is defined by the reference points. The movement of a node within the group from location t to t+1 is reported to the logical center of the group. As shown in Figure 1. Eachtime the center of the group moves its new location RP (t+1) is calculated with the updating of reference points. The updated values are added to the random vector.

4. LITERATURE REVIEW

Steering conventions beneath different versatility fashions had been assessed for execution by numerous scientists inside the modern beyond. While some scientists have considered just the Random Waypoint Mobility Model, others have worked with numerous portability fashions. The exceptional proactive, responsive and half of breed conventions were analyzed via the creators in [6-20].
A. Bharadwaj and Dr. A.Singh et al. [9] have utilized Qualnet take a look at device to assess the execution of Optimized Link State Routing (OLSR), Fisheye State Routing (FSR) and Dynamic Source Routing (DSR) convention. The correlation of the conventions is carried out in light of the Packet Delivery Ratio, Average Jitter, Average quit to cease defer and throughput. Sunil et al. [10] have seemed through reproduction that versatility impacts the execution of the guidance conventions.
Gupta et al. [11] concept approximately Random Waypoint, Reference Point Group Mobility and Freeway Mobility Model with DSDV and AODV conventions. The duplicate underneath the models indicated above was achieved and throughput turned into concept approximately. The throughput of the conventions was idea approximately under the portability fashions decided formerly.
Al-Mahdi et al. [17] experimented with various speeds of nodes for DSDV, OLSR and AODV protocols. They used RPGM and Manhattan Grid mobility fashions. Packet delivery ratio, average throughput and average end to stop delay had been used as performance metrics.
Bharadwaj and Singh [12] arrived at a end that the highest quality overall performance of routing protocols may be achieved with the aid of the usage of the correct mobility

version. For this, they taken into consideration AOMDV, DSDV, DSR, and AODV routing protocols with Random Walk mobility, Manhattan Grid and Gauss Markov models. A simulation area of 700m x 700m of about fifty nodes was considered.

A. K. Maurya et al [10] state that the overall performance of a routing protocol is laid low with the choice of the mobility model. A routing protocol may additionally carry out inferiorly for some mobility version at the same time as the equal protocol can be powerful for some different mobility version. Hence, evaluation of a routing protocol is usually primarily based on insufficient data main to the inaccurate end. The authors have selected 3 mobility models. Each version is one-of-a-kind in phrases of the motion of the node. The protocol analysed become the Ad Hoc On Demand Distance Vector (AODV) and the mobility fashions taken into consideration were Gauss Markov, Reference Point Group Mobility (RPGM) and Manhattan. Extensive simulation runs have been completed and results were compared among each mobility model. NS-2 become used for simulation. Maximum speed of the nodes was set to 0 m/s, 10 m/s and 20m/s. The number of supply and destination pair was set to 6 that were selected from a collection of 50 nodes. The selected supply node transmitted information packets at a randomly chosen begin time and completed at 250 seconds of simulation time. In each test visitors was set to be transmitted at a fee of four packets / sec. Each packet become constant to 512 bytes. The simulation effects showed that at better velocity, routes became more unstable and doubtlessly broke, resulting in unidirectional hyperlinks. The Gauss Markov version produced greater unidirectional links in comparison with RPGM and Manhattan models. The effects genuinely showed that the choice of mobility version had an impact on the performance of the routing protocol.

A.K.Shukla et al. [12] taken into consideration various portability fashions with Wireless advert hoc Networks directing conventions to offer research a extra experienced decision of versatility display for the specified` steering conventions. A relative research of a part of the modern-day portability models is delivered in an collection of exercise settings.The parameters like throughput, quit to end defer and package deal conveyance share are taken into consideration. The conventions utilized for reenactment are Destination Sequenced Distance Vector (DSDV), Dynamic Source Routing (DSR) and Ad-Hoc On Demand Distance Vector (AODV). The versatility models taken into consideration in the simulative examination are City Section Mobility Model and Manhattan Mobility Model. System Simulator NS-2.35 is utilized for the simulative research. The creators presume that the execution of a versatility show was extensively impacted through the device convention. The City Section Model and the Manhattan Model yield a reasonably larger wide variety of jumps for least leap publications and a commonly littler lifetime for stable courses. The Manhattan versatility display displayed more suitable execution while contrasted with the City Section portability demonstrates.

Sreerama et.al,[20] did performance assessment of DSR and AODV protocols underneath the Random Way Point (RWP) and Reference Point Group Mobility Model (RPGM) mobility fashions. Performance metrics taken into consideration have been Packet Delivery Ratio (PDR), Average Routing Overhead (ARH), Average End to End Delay (AEED) and Throughput. The simulation become accomplished for 900 seconds for a community vicinity of 800 m X 500 m with 250 m transmission variety. The first scenario as compared the mobility models for 5, 10, 15, 20 and 25 nodes with constant speed 15 m/s. The 2nd scenario evaluated the mobility models with one-of-a-kind node speeds of five, 10, 15 and 20 m/s for a set variety of fifty nodes. Random Way Point Model had the bottom routing overhead and became considered higher for routing conversation. RWP additionally done better in delivering packets to the vacation spot. The authors concluded that Random Way Point is the first-class version and it outperformed the Reference Point Group Mobility model for the situations considered in the observe.

Munish Sharma et al. [16] considered the impact of mobility on DSDV, AODV and DSR protocols. Node mobility situation is created for 50 nodes, topology boundary of 500 X 500 m2 and simulation time of one hundred seconds. In one set of situation, the duration of pause time was numerous. Values of pause time were taken as 0, 10, 20, 40 and one hundred simulation seconds. The movement pace changed into 20 m/s. In the second one state of affairs the fee of pause time changed into stored unchanged while the speed became changed from 10 to 50 m/s. Packet Delivery Ratio (PDR), Average End to End Delay and Normalized Routing Load (NRL) have been taken because the overall performance metrics. The effects showed that AODV and DSR finished high values of PDR. In low mobility and low load eventualities, all three protocols completed in a comparable manner. DSR outperformed AODV and DSDV with accelerated mobility and cargo. It is attributed to the competitive use of caching and the shortage of mechanism to run out stale routes. Authors have advised as future work that the routing protocols should be examined with other metrics consisting of strength intake, fault tolerance, wide variety of hops, jitter, etc. With recognize to diverse mobility fashions.

It is quite evident from the above discussion that the practical mobility fashions have a massive effect at the performance evaluation of routing protocols in MANETs. The Mobility Models vary of their applicability in extraordinary scenarios. If the mobility of the nodes under a given situation is modeled as it should be the results of the protocols will be dependable. The sizable evaluation of mobility fashions must be done to gauge their appropriateness to the given state of affairs".

5. PERFORMANCE ESTIMATIONAND RESULT ANALYSIS

The wireless networks analyzed have been carried out applying Network Simulator-2.35 and its related tools for simulation and study of analysis. We select a Linux platform, i.e. UBUNTU 12.08 LTS, as Linux recommend a number of programming improvement tools that can be

applied through the simulation procedure. We have produced mobility scenarios of Mobility Model are applying BONNMOTION2.0; they can be included into TCL scripts. Random traffic links ofCBR can be set up among mobile nodes applying a traffic-scenario creator script. BONNMOTION-20 is java supported tool for creating mobility scenario for several mobility models, developed by University of Bonn, Germany.

To obtain an enhanced feel of the works done, as discussed in literature review, a comprehensive performance analysis is done. Network Simulator-NS-2.35 is used for performance evaluation. Five different areas of networks are considered as given in the given table 1:

TABLE 1: PERFORMANCE PARAMETERS

Parameter	Value
Channel type	Wireless channel
Simulator	NS 2 (Version 2.35)
Protocols	DSR
Simulation duration	800s
Number of nodes	15,30,45
Transmission range	370m
Movement Model	RPGM, Gauss Markov Model
MAC Layer Protocol	802.11
Pause Time (s)	15 ± 4 s
Maximum speed	20
Minimum speed	0.5
Packet Rate	4 packet/s
Traffic type	CBR (Constant Bit Rate)
Data Payload	512 bytes/packet
Max of CBR connections	10,20,30
Environment Size	600m *600m
Channel type	Wireless channel

5.1 Performance Parameters

The organization of routing protocols is through the following important Quality of Services (QoS) metrics for usual procedures:

5.1.1 Packet Delivery Ratio (PDR)

It has classified in [20-24] as the fraction among the amount of packets created with the application layer. It has the fraction of data packets send to the target to those created from the starting point. It is estimated by separating the amount of packets obtained by target throughout the packet initiated from the source.

PDF = (Pr /Ps)*100,

Pr = total Packet obtain

Ps = the total Packet transmit.

5.1.2 Throughput

It has the standard amount of messages effectively send per unit time number of bits delivered per second [10].

Throughput = (Total received packets/ total simulation time) Kbits/Sec

N = number of data sources.

5.1.3Average End-to-End Delay

It has described as the time in use for a packet to be broadcast across an Ad Hoc from basis to target.

D = (Tr –Ts),

Tr = receive Time

Ts =sent Time

5.2 Result Analysis

In the case of presentation investigation we have measured presentation parameters. In Figure 2, 3,4 The simulations are focused on Analyzing the performance of routing overhead, the simulations are focused on throughputs and packet delivery ratio. The results also compared with Simple Human Mobility Model and random way point mobility. The result will also show the performance for every mobility model that had been selected. Here, DSR routing protocol is used for this.

5.2.1 Throughput:

Random Way Point Mobility Model hasbetter throughputs. Due to the lower number of hops, the high throughput is contributed the lower delay.The high throughput is contributed the lower delay.

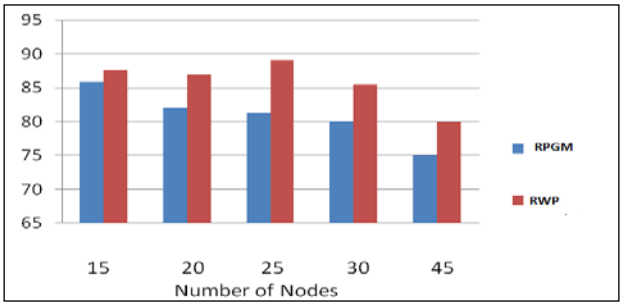

Figure2:Throughput versus number of nodes

5.2.2 Packet Delivery Ratio (PDR):

Random Way Point Mobility Model Model performed better in delivering packet data to destination by considering the pause time every time changing their directions. The Random Way Point Mobility Model is improved significant with the increasing number of nodes the proposed mobility models are improved significant because the number of load is small and the traffic is not heavy.

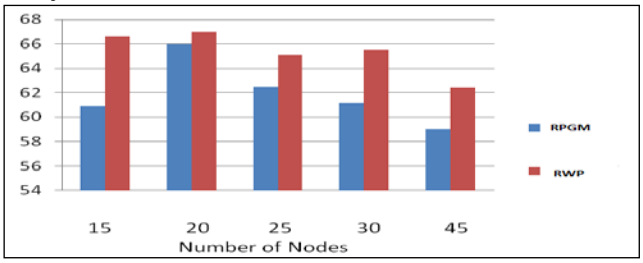

Figure. 3. PDR versus number of nodes

5.2.3 Average End to End Delays:

Due to the movement of each mobile node ,it shows that the proposed mobility model is generated the highest routing overhead compared with the RPGM model nodes are being enforced to the border of the simulation area before changing track. Random Way Point Mobility Model performs lowest routing overhead and it's good for the routing communication.

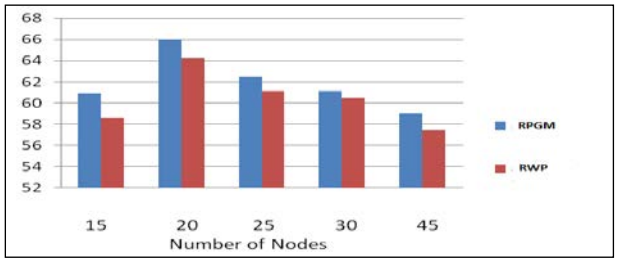

Figure. 4. Routing Overhead vs. Number of Nodes

6. CONCLUSIONS

"In this section we have thought about use of Ad Hoc wireless network routing protocols as DSR for sensor node. The Random Way Point Mobility Model predicts the node movement more significant as compared to RPGM. This reduces the link failure in the network which results is less number of packet loss and improvement in throughput and end to end delay. The Random Way Point Mobility Model reduce the number of messages required by routing protocol for maintaining the result, because link failure has been minimized based on person movement. This is turn makes the network available for data transfer which contribute in enhancement of Quality of Services (QoS) parameters such as Throughput,Packet loss ratio, End to End Delay.

In the Random Way point Mobility Model, we have calculated the various performance parameters with respect to Simple Human Mobility Model, Random Way point Mobility models using DSR routing protocol. The Random Way Point Mobility Model has shown better results in terms of Throughput, PDR and end to end delay where DSR has been taken as a routing protocol. The improvement in performance is achieved by better prediction of nodes".

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